

SCOPE OF CLAIMED INVENTION

1. A method for examining foreign matters in through holes, the method characterized in that light passing through a plurality of through holes having a uniform size is taken as image data by relative translation movement of a line sensor camera, and sizes of regions that receive individual passing light in the image data are mutually compared to determine presence or absence of foreign matter.

2. A method for examining foreign matters in through holes, the method characterized in that light passing through a plurality of through holes having a uniform size is taken as image data in a unit of an individual through hole or in a unit of a group consisting of a plurality of the through holes by an area sensor camera, and sizes of light receiving regions that correspond to respective through holes in the image data are mutually compared to determine presence or absence of foreign matter.

3. A method for examining foreign matters in through holes according to claim 1, wherein, after counting and determining a number of areas of light receiving regions corresponding to the through holes, the areas of light receiving regions are mutually compared.

4. A method for examining foreign matters in through holes according to claim 1, wherein areas of light receiving regions are labeled and the labeled areas of light receiving regions are mutually compared to determine presence or absence of foreign matter.

5. A method for examining foreign matters in through holes according to claim 1, wherein said step of mutually comparing sizes of regions that receive individual passing light in the image data is based on magnitudes of differences in light receiving regions of adjacent ones of the through holes to determine presence or absence of foreign matter.

6. A method for examining through holes, the method characterized in that imaging is conducted with an imaging focal point of one of a line sensor camera and an area sensor camera being shifted with respect to a surface of a work piece.

7. A method for examining through holes according to claim 6, wherein the imaging focal point being shifted with respect to the surface of the work piece expands an image area of the passing light.

8. An apparatus for examining foreign matters in through holes, the apparatus comprising:

a light source provided on one side of a work piece and a line sensor camera provided on the other side of the work piece, the work piece having a plurality of through holes;

a parallel displacement system that translates the work piece and the line sensor camera relative to each other to allow the line sensor camera to detect light passing through the plurality of through holes in one lot; and

an image processing device that receives detected signals provided by the line sensor camera to obtain a plurality of binary image data corresponding to the plurality of through holes in the work piece,

wherein the image processing device is equipped with a determination device that makes a determination as to whether foreign matter is present or absent in the through holes based on deviations among receiving light regions corresponding to the respective through holes.

9. An apparatus for examining foreign matters in through holes, the apparatus comprising:

a light source provided on one side of a work piece and an area sensor camera provided on the other side of the work piece, the work piece having a plurality of through holes;

a parallel displacement system that translates the work piece and the area sensor camera relative to one another to allow the area sensor camera to detect light passing through each individual one of the plurality of through holes or through the plurality of through holes in one lot; and

an image processing device that receives imaging signals provided by the area sensor camera to obtain a plurality of binary image data corresponding to the plurality of through holes in the work piece,

wherein the image processing device is equipped with a determination device that makes a determination as to whether foreign matter is present or absent in the through holes based on deviations among receiving light regions corresponding to the respective through holes.

10. An apparatus for through holes characterized in that relative positions of one of a line sensor camera or an area sensor camera and a surface of a work piece are set such that an imaging focal point of the line sensor camera or the area sensor camera is shifted from the surface of the work piece.

11. An apparatus for examining through holes according to claim 10, wherein imaging is conducted with an image area of the passing light being expanded.